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August 23, 2001

Mr. Doug Bauer
Alaska Department of Environmental Conservation
Contaminated Sites Remediation Program
610 University Ave
Fairbanks, Alaska 99709-3643

Supplemental Investigation and Corrective Action Plan
NC Machinery Facility
730 Old Steese Highway, Fairbanks, Alaska
File #102.26.055, Facility #613
URS Job No. 53-26450002.00

Dear Mr. Bauer:

1.0 INTRODUCTION

On behalf of Skinner Corporation, we are providing this Supplemental Investigation and Corrective Action Plan for the NC Machinery facility at 730 Old Steese Highway in Fairbanks, Alaska (the "Site") (Figure 1). In1991 and 1994, Skinner performed an investigation and removal of an underground storage tank (UST) and dry wells at the Site. Since that work, Skinner has been monitoring the natural biodegradation of the residual petroleum hydrocarbons and volatile organic compounds (VOCs) in the area of former dry well (DW-1) and UST No. 7 (Figure 2). This proposed Supplemental Investigation and Corrective Action Plan was prepared to address these residual contaminants.

In preparation for development of this work plan, URS reviewed the prior investigation, remediation and groundwater monitoring documents for the Site including the following:

- Dames and Moore, June 28, 1995 "Final Report UST Site Assessment/Release Investigation and Corrective Action, NC Machinery".
- Dames and Moore, November 18, 1996 "Quarterly Groundwater Monitoring July and October 1996, NC Machinery".
- Dames and Moore, October 14, 1997 " Quarterly Groundwater Monitoring February and April 1997".

These reports were previously provided to the ADEC case manager, Mr. Mehrdad Nadem, whom we understand is no longer working for ADEC. We are directing this submission to you because we understand that you are the new case manager assigned to this file.

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This proposed supplemental investigation and corrective action plan is intended to address the residual diesel and oil range petroleum hydrocarbons in soil and groundwater. In brief, Skinner Corporation is planning to undertake certain additional investigations of the extent of residual petroleum hydrocarbons and implement in situ chemical oxidation to further remediate hydrocarbons.

2.0 SUMMARY OF PRIOR CORRECTIVE ACTION

2.1 SITE BACKGROUND

The Fairbanks facility occupies approximately 5 acres and consists of three (3) main buildings: Main Service Shop Building, Warehouse Building No.1, and Warehouse Building No.2 (Figure 2). In addition, there are three (3) outdoor covered storage areas located on the western portion of the property and two relatively small storage sheds located on the north and south portions of the property. Land use in the Site vicinity is mixed commercial and light industrial. The Main Service Shop Building is located in the eastern portion of the Site and is divided into three main work areas: an office space, a parts storage and service counter, and the Main Service Shop with service bays. The interior floor drains in the Main Service Shop were previously designed to direct water and other liquids generated during daily operations to three sediment settling sumps and the liquids were then directed to a former dry well (DW-1) located north of building (Figure 2).

2.2 REMOVAL OF DRY WELL (DW-1)

In 1994, a corrective action was implemented to remove petroleum-affected soils surrounding an inactive dry well referred to as DW-1. Borings were drilled in the area of the dry well to assess the extent of petroleum hydrocarbons in the soil. The boring locations are shown on Figure 2. Approximately 485 cubic yards of petroleum affected soil were removed.

During the soil removal activities, petroleum affected soil in the eastern portion of the excavation appeared to be limited to a thin zone of soil near the groundwater interface at approximately 15 feet bgs (Figure 2). This limited zone of petroleum affected soil on the east wall of the excavation was removed up to soil boring B-11. The sample results for B-11 indicated that oil and diesel range petroleum hydrocarbons were detected only in the sample collected at 15 feet bgs which is at the soil/water interface. Oil and diesel range petroleum hydrocarbons were not detected in boring B-8 that was completed approximately 10 feet east of boring B-11 (Figure 2).

The results of samples collected from B-8 and B-11 and the observation made during excavation indicated that a "thin" layer of petroleum affected soil was present at 15 feet bgs and was limited in lateral extent. Further excavation was not conducted east of boring B-11 due to the small volume of the petroleum affected soil, its

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location beneath approximately 14 feet of clean soil and an 8-inch thick concrete-covered ground surface. Approximately 15 cubic yards of petroleum affected soil above the ADEC Level B cleanup level was estmated to remain in this area (Figure 3). Removal of UST No. 7.

2.3 REMOVAL OF UST NO. 7

In 1991, the former waste oil UST (Tank No. 7) located west of the Main Shop Building was removed by NC personnel (Figure 2). The UST removal and subsequent investigation was documented in a report prepared by NC entitled "Site Assessment Report, Release Investigation Report and Interim Corrective Action Report for Used Oil UST Removal" dated November 11, 1992. VOC and petroleum hydrocarbon affected soils were encountered during UST removal. The apparent source of the release was leakage from the piping between the UST and the Main Shop building.

The remedial actions included excavating the affected soils as close to the Main Shop building as was feasible without undermining the building foundation. Concentrations of oil range petroleum hydrocarbons were detected along the east wall adjacent to the building which exceeded cleanup levels.

ADEC subsequently requested that NC perform an additional assessment to further assess the presence of VOCs in soil and groundwater and the lateral extent of petroleum hydrocarbons beneath the building foundation along the east wall of the excavation. Three monitoring wells (MW-1, MW-2, and MW-3) were installed by NC and additional soil and groundwater samples were collected in fall of 1992. Groundwater samples collected from MW-1 in the area of former Tank 7 excavation detected oil range petroleum hydrocarbons, 1,1,1-trichloroethane (TCA), trichloroethylene (TCE) and tetrachloroethylene (PCE) in groundwater. These constituents were not detected in wells MW-2 and MW-3.

After installation of the monitoring wells and the sampling activities, a work plan was prepared to further assess the extent of used oil and VOCs. ADEC approved this work plan during a meeting on November 17, 1992. In accordance with the approved plan, additional soil borings were drilled and one additional monitoring well (MW-4) was installed. VOCs and petroleum hydrocarbons were not detected in the soil borings located east and southwest of the former tank excavation. Petroleum hydrocarbon concentrations below the ADEC B cleanup levels (ranging from 15 to 100 mg/kg) were detected in soil samples collected below the base of the Tank 7 excavation (Dames and Moore, 1995).

Based on these results and previous post-excavation soil samples collected in 1992, a limited amount of soil containing petroleum hydrocarbon at levels above the ADEC B cleanup levels remain at the base of the former Tank 7. A limited amount of petroleum hydrocarbon affected soil above the relevant ADEC cleanup standard is also present beneath the building foundation, east of the former excavation. NC personnel estimated approximately 10 cubic yards of petroleum affected soil associated with former Tank No. 7 was left in place. The petroleum affected soil located beneath the adjacent building appears to extend to approximately 20 feet bgs. The soil was left in place due to access limitations and the potential to impact building structural integrity.

2.4 PREVIOUS GROUNDWATER MONITORING

The shallow groundwater quality beneath the property has been monitored since 1993. Based on the early groundwater monitoring data, it was apparent that the shallow groundwater at the Site has been affected by diesel and oil-range petroleum hydrocarbons (DRPH) in the immediate vicinity of Tank No. 7 (MW-1 and MW-4) and former dry well (MW-6). BTEX and chlorinated volatile organic compounds (VOCs) above the ADEC Table C cleanup levels were also detected in MW-6.

The previous groundwater monitoring results are summarized in Tables 1 and 2. The groundwater was recently sampled in January 2001 and elevated levels of diesel range petroleum hydrocarbon are still present in the groundwater at MW-1 (6.3 mg/l) and MW-6 (46.8 mg/l). Oil range petroleum hydrocarbon (35.6 mg/l) and PCE (22.8 ug/l) were also detected in the groundwater at MW-6 above the Table C cleanup levels.

Since the concentrations of these compounds remain above the Table C cleanup levels, further remedial action will be implemented as outlined in the following sections.

3.0 OBJECTIVES AND SCOPE OF FURTHER REMEDIAL ACTION

Based upon the groundwater monitoring and prior remedial actions performed at the Site, it appears that a small quantity of source material is present in the "smear zone" of the groundwater table in the area of the former dry well (DW-1) and former Tank No. 7. The objectives of the corrective action will be to treat the soils and groundwater affected by the diesel and oil-range petroleum hydrocarbon and PCE within the "smear zone" by in situ chemical oxidation.

3.1 OVERVIEW OF IN SITU CHEMOCAL OXIDATION

In situ chemical oxidation involves the injection of hydrogen peroxide to oxidize contaminants in the subsurface and break down their chemical composition. The oxidation process breaks down contaminant compounds and ultimately results in mineralizing the compounds. The oxidation process is exothermic. The heat generated during the exothermic oxidation reaction is also beneficial to the remedial process because it will heat the subsurface soil which further enhances volatilization. The oxygen content in the groundwater is also increased which can further stimulate in situ biodegradation.

The chemical oxidation process is related to Fenton's Reaction, whereby the hydrogen peroxide reacts with ferrous iron in the soils to produce a hydroxyl free radical. This free radical is capable of oxidizing organic constituents in the groundwater and saturated soils within the treatment area. URS will retain Terra Vac to perform the chemical oxidation bench scale and pilot studies, remedial design and implementation of the in situ treatment of the soil and groundwater.

3.2 PRE-FIELD ACTIVITIES AND PLANNING DOCUMENTS

The following activities will be completed prior to performing remedial action fieldwork.

3.2.1 Health and Safety Plan and Utility Clearance

In accordance with Occupational Health and Safety Administration regulations, URS will modify the existing Site specific Health and Safety plan to include all tasks in this plan to be performed during Site work. Terra Vac will also prepare a Health and Safety plan to cover the remedial tasks concerning the hydrogen peroxide application. Prior to beginning fieldwork, URS will contact the call locate center to alert local utilities of the planned well installation and will coordinate with onsite NC personnel.

3.2.2 Supplemental Investigation

Prior to conducting the in situ chemical oxidation remediation, additional soil and groundwater characterization will be conducted to assess:

1. The area of residual diesel and oil range petroleum hydrocarbons in the soil; and

2. The extent of petroleum hydrocarbons remaining in the groundwater downgradient of the former dry well and Tank No. 7.

The supplemental investigation is outlined below.

Soil borings will be drilled in the vicinity of former dry well, DW-1, and Tank No.7 using a truck-mounted hollow stem auger drill rig. A licensed well drilling contractor will be retained to perform the drilling services. The proposed locations of the borings are shown on Figure 3. Based on existing groundwater level data from monitoring well MW-1, 2, 4 and 6, and the depth of soil contamination noted during the previous dry well and tank removal, the borings are expected to be completed to depths ranging from approximately 17 feet to 20 feet bgs.

Soil samples will generally be collected continuously from five feet in depth to the total depth of the boring. The samples will be screened using a photoionization detector (PID) and the results will be recorded on a log prepared for each boring by a URS geologist. One soil sample will be selected from each boring for chemical analysis based on the field screening results. Groundwater samples will be collected from selected borings using GeoProbe sampling techniques or an equivalent method. The groundwater samples will be collected by retracting the GeoProbe sampler screen two feet within the top of the saturated zone.

The soil and groundwater samples will be analyzed for DRO by AK 102, RRO by AK103 and VOCs by EPA Method 8260B at the former dry well location. Soil and groundwater samples in the former UST area will be analysed for DRO and RRO. A selected number of soil samples will also be analyzed for total organic carbon (TOC) and pH, and groundwater samples for total iron and ferrous iron to assist in the remedial system desig. A selected number of groundwater samples will also be analyzed for chemical oxygen demand (COD) and field testing for dissolved oxygen (DO), pH, conductivity and oxidation reduction potential (ORP) will be conducted. The samples will be placed in the appropriate laboratory-supplied containers and labeled with the sample number, depth, time, date of collection, collector's name, and requested laboratory analyses. The soil samples will be placed in an ice chest cooled with blue ice and delivered to an ADEC approved laboratory under standard chain of custody procedures. Soil samples selected for the bench scale study described in Section 3.2.3 will be shipped to Terra Vac's Windsor, NJ laboratory.

Drilling equipment will be decontaminated between each boring with a steam cleaner. All sampling equipment will be decontaminated by washing in an Alconox detergent then rinsed with tap water and double rinsed with deionized water between each sample. All soil cuttings will be placed in 55-gallon drums and stored onsite for disposal pending the soil remedial excavation activities.

3.2.3 In Situ Chemical Oxidation Bench Scale and Pilot Studies

After the supplemental investigation work is completed, soil samples will be provided to Terra Vac for a bench scale study to assess the efficacy of the in situ chemical oxidation technology prior to the full-scale implementation. Terra Vac will also perform a pilot study of the in situ chemical process. The purpose of the bench scale and pilot studies will be to collect the necessary information regarding the reaction rates and radius of influence of the hydrogen peroxide injections. This information will be used to develop the full scale design of the remedial system. The scope of the pilot study is outlined in the Terra Vac "Pilot Study and Full Scale Design Proposal" provided in Appendix A. The proposed pilot study injection wells will be installed during the mobilization for the supplemental investigation drilling program.

3.3 IN SITU CHEMICAL OXIDATION

The preliminary remedial design consists of a total of 20 injection wells installed within in the areas containing elevated levels of diesel and oil range petroleum hydrocarbons in the smear zone and dissolved phase hydrocarbon zone. The final remedial design will be prepared based upon the supplemental investigation and pilot study results. The proposed design, system construction and installation and operation of the in situ chemical oxidation system is outlined in Terra Vac's design proposal provided in Appendix A. A qualified scientist will be on-site during the installation of the remedial system.

A selected number of the injection wells will have their elevations surveyed by a licensed surveyor to assist in groundwater flow measurements at the Site. The injection well will be developed within 24-hours after installation by removing a minimum of five well casing volumes of groundwater using a disposable Teflon bailer. During development, water quality parameters (pH, temperature, dissolved oxygen (DO) and conductivity) will be measured and recorded.

3.4 LONG TERM GROUNDWATER MONITORING

In order to assess the effectiveness of this additional corrective action, URS will conduct quarterly groundwater monitoring. Five of the existing monitoring wells (MW-1, 3, 4, 6, and 7) will be sampled on a quarterly basis during the treatment period.

The groundwater sampling will be conducted in general conformance with the procedures outlined in ADEC's "Guidance for Cleanup of Petroleum Contaminated Sites" dated September 2000. Groundwater samples will be collected using a disposable Teflon bailer. Prior to sample collection, the depth to groundwater will be measured to the nearest 0.01-foot using a water level indicator. The monitoring well will be purged by removing a minimum of three well volumes. Water quality parameters (pH, temperature, DO, and conductivity) will be measured and recorded for each well. The water samples will be analyzed for DRO, RRO and VOCs. Each sample will be placed in the appropriate laboratory-supplied container and labeled with the sample number, depth, time, date of collection, collector's name, and requested laboratory analyses. The water samples will be placed in an ice chest cooled with blue ice and delivered to an ADEC certified laboratory under standard chain of custody procedures. Purge water will be combined with development water, contained in a steel 55-gallon drum and stored onsite, and disposed of following receipt of analytical results.

When the "rebound testing" described in Appendix A indicates that the groundwater cleanup has been achieved, or contaminant levels have shown a significant and steady decline, the necessity for further long-term monitoring and Site closure will be discussed with ADEC. We expect that the corrective action will reduce the petroleum and VOC concentrations in the former dry well and petroleum levels at former UST No. 7 to

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below ADEC Table C levels. The outer edge of the impacted groundwater zone will likely meet ADEC cleanup levels under the ADEC 10X Rule.

3.5 REPORTING

A letter report will be prepared summarizing the results of the supplemental investigation and pilot study prior to the installation of the full scale system. The letter report will outline the fieldwork completed and the results of the soil and groundwater sampling and analyses. The report will include a Site plan depicting the areas of residual soil contamination and the extent of groundwater contamination. The installation of the full scale corrective action in situ chemical oxidation will proceed based upon the results of the supplemental investigation and pilot study.

A cleanup action final report (CAFR) will be prepared following the implementation of the remedial measures. The report format will be in general conformance with ADEC's "Handbook for Conducting Cleanups of Contaminated Sites and Regulated UST under the Voluntary Cleanup Program" dated March 2000. Subsequent to submission of this report and meeting applicable cleanup levels, Skinner Corporation will request a Site closure letter from ADEC.

4.0 SCHEDULE

The pre-field activities and tasks will be initiated immediately following ADEC's approval of this work plan so that the remedial action may begin as early as September 2001. The investigation and pilot study will require two to three field days and the analytical data will be available for review within two weeks of submitting the soil and groundwater samples. URS will provide the supplemental investigation letter report within two weeks of receipt of all analytical data. A draft CAFR will be prepared within two weeks of receipt of the last round of quarterly groundwater sampling.

To facilitate review and implementation of this proposal, URS suggests the following schedule:

URS PROPOSAL SUBMITTED:	August 23, 2001
ADEC COMMENTS OR APPROVAL:	August 31, 2001
URS REVISED PROPOSAL (if necessary)	September 6, 2001
FINAL ADEC APPROVAL	September 7, 2001
INTIATION OF FIELD ACTIVITIES	September, 2001
INTERIM & FINAL REPORTING	Per Corrective Action Plan

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We will contact you within the next several days to discuss the proposed schedule and additional remedial actions. We are available to meet with you at your convenience to discuss the plan. In the interim, please do not hesitate to contact us if you have any questions at (206) 438-2284.

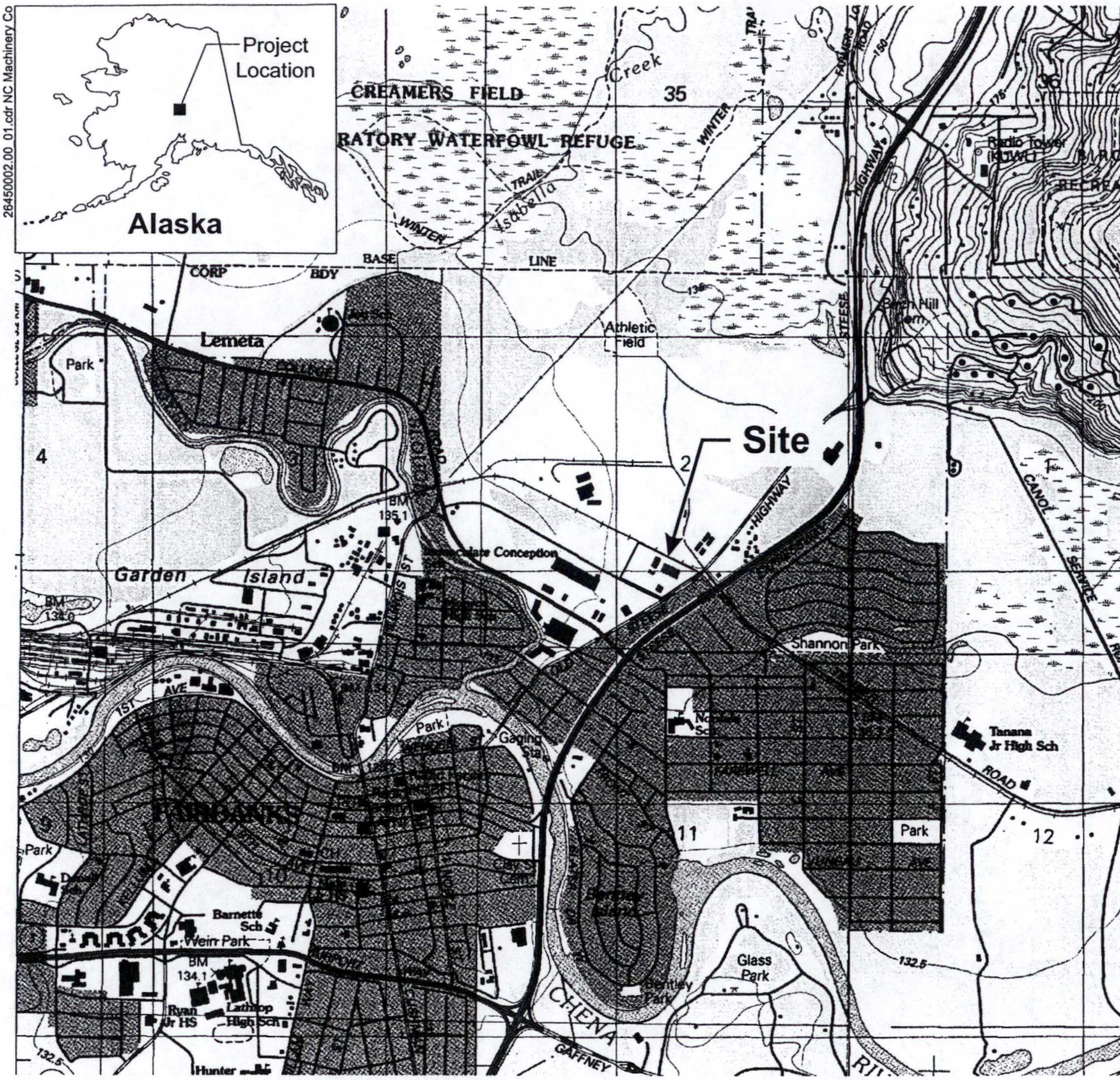
Sincerely,

URS CORPORATION

David Raubvogel
Senior Geologist

Attachments: Figures 1, 2 and 3
Tables 1 and 2
Appendix A – Terra Vac Pilot Study and Full Scale Proposal

Copy John Houlihan, Paul Dworian, Victoria Childs



Map created with TOPO!™ © 1997 Wildflower Productions, www.topo.com, based on USGS topographic map

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Approximate Scale in Miles

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Figure 1
Site Location Map

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NC Machinery Co.
Fairbanks, Alaska

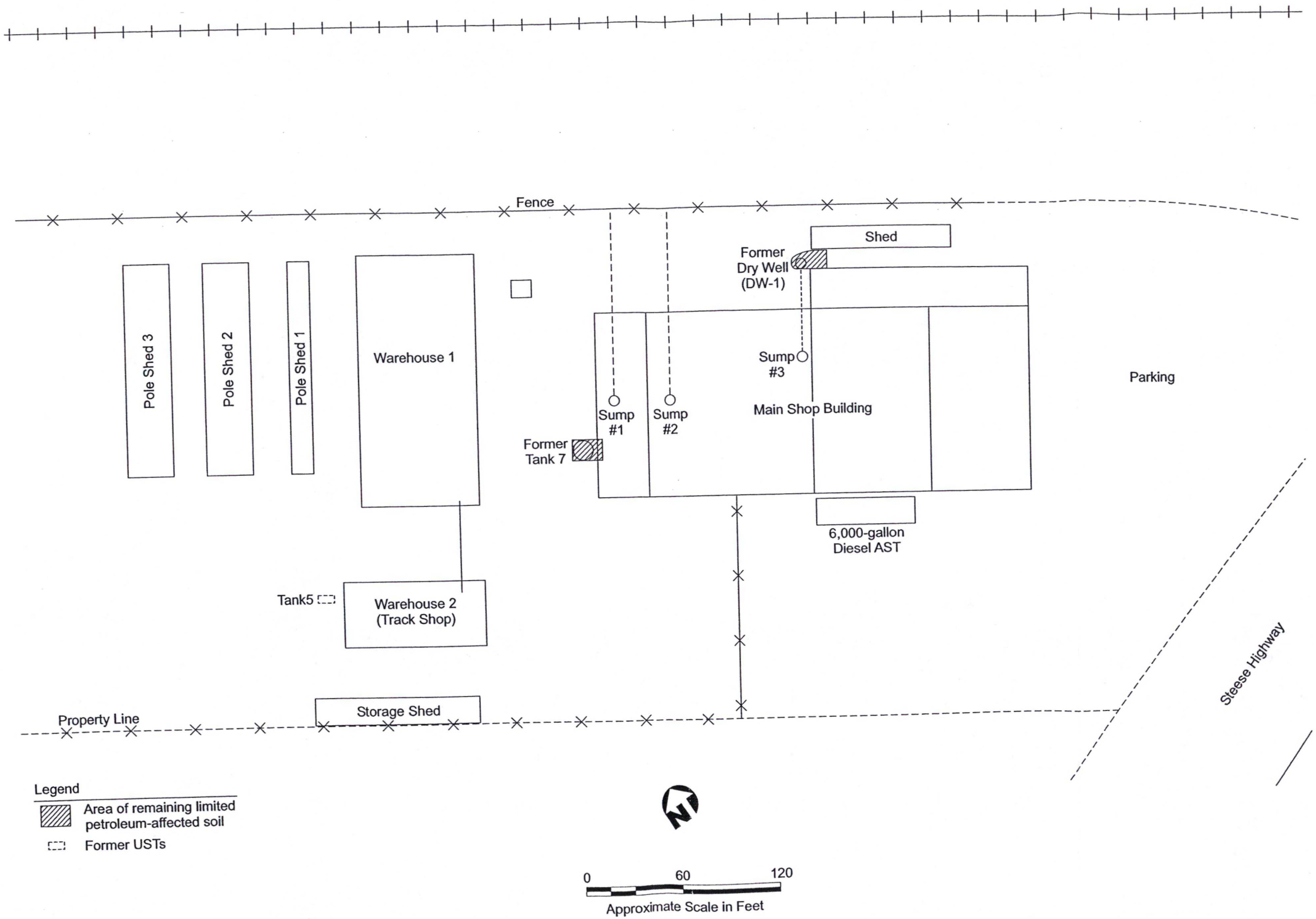

Figure 2
Site Plan

Job No. 53-26450002.00

NC Machinery Co.
Fairbanks, Alaska

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26450002.00_02.cdr NC Machinery Co

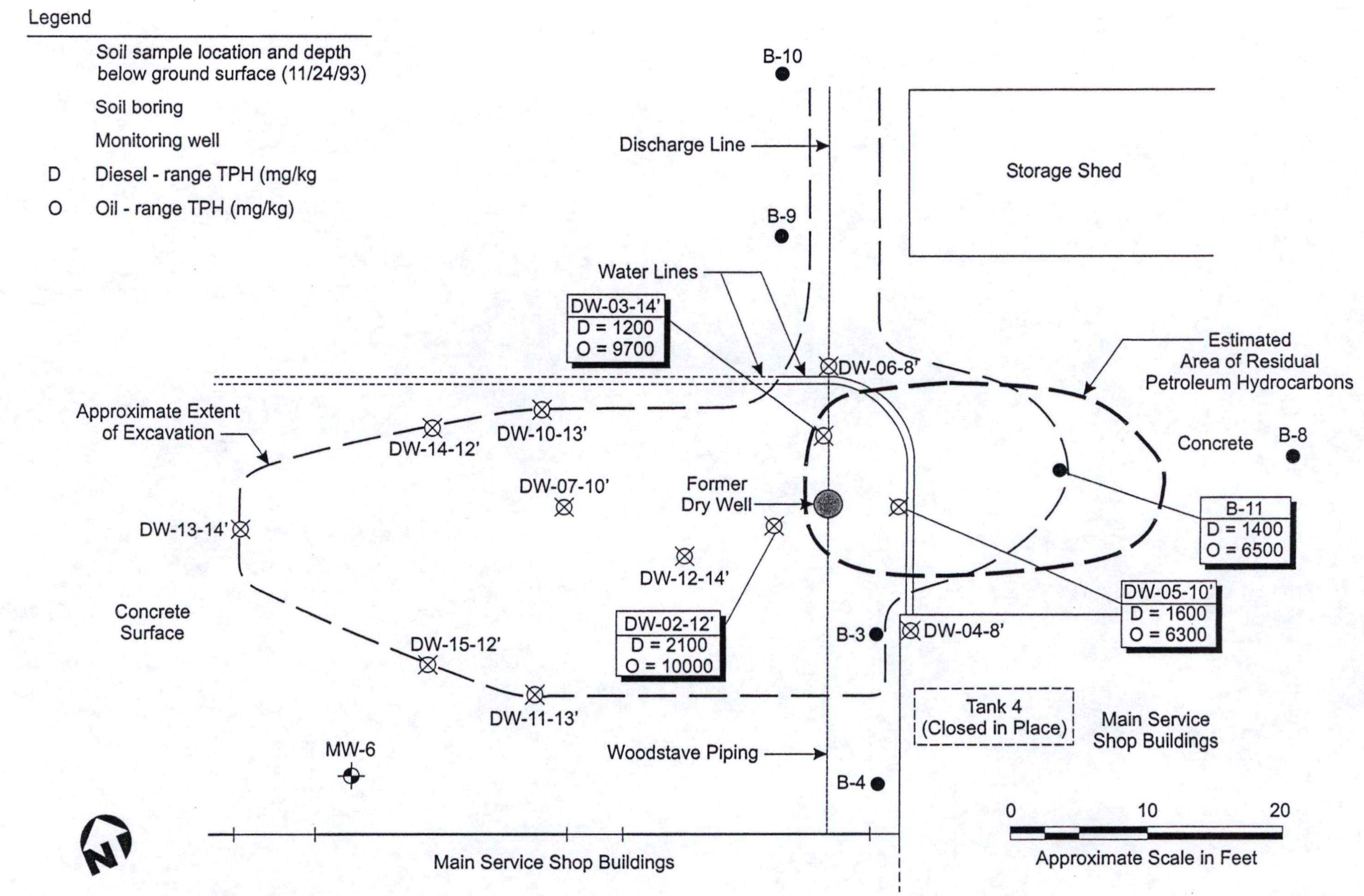

Figure 3
Estimated Area of Petroleum Affected Soils

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NC Machinery Co.
Fairbanks, Alaska

Table 1
Summary of Groundwater Petroleum Hydrocarbon Analytical Results
NC Machinery
Fairbanks, Alaska

Sample ID	Sample Date	Total Petroleum Hydrocarbons (mg/L)			Volatile Aromatic Compounds (mg/L) [1]			
		Gasoline-Range [1]	Diesel-Range [2]	Residual Oil-Range [3]	Benzene	Toluene	Ethylbenzene	Total Xylenes
MW-1	03/25/93			0.2 U	0.001U	0.001U	0.001U	0.016
	05/03/93				0.001U	0.001U	0.001U	0.01
	06/09/93			0.9				
	07/01/93			**1.7**	0.001U	0.001U	0.001U	0.007
	07/29/93			**1.2**	0.001U	0.001U	0.001U	0.0078
	08/30/93			0.8	0.001	0.002	0.003	0.025
	12/03/93		**2.8**	**2**	0.001	0.002	0.001	0.023
	06/22/94		1.4	**5**	0.001 U	0.001	0.001 U	0.013
	09/29/94		**12**	**3.5**	0.002	0.001	0.001 U	0.01
	07/15/96		**2.2**	**4.1**	0.001 U	0.001	0.004	0.015
	10/17/96		**10**	**15**	0.001 U	0.002	0.001 U	0.017
	01/22/97		**7.2**	**13**	0.001 U	0.001	0.001 U	0.017
	04/09/97		**8.6**	**19**	0.001 U	0.001 U	0.001 U	0.009
	01/11/01	0.134	**6.3**	1.1	0.005 U	0.00547	0.002 U	0.0167
MW-2	03/25/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	05/03/93				0.001 U	0.001 U	0.001 U	0.001 U
	06/09/93			0.2 U				
	07/01/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	07/29/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	08/30/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	12/03/93		0.05 U	0.4	0.001 U	0.001 U	0.001 U	0.002 U
	03/30/94		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	06/22/94		0.08	0.6	0.001 U	0.001 U	0.001 U	0.004
	09/29/94		1.3	0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	07/15/96		0.17	1.0 U				
	10/15/96		0.25	1.0 U				
	01/21/97		0.24 U	1.0 U				
MW-3	03/25/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	05/03/93				0.001 U	0.001 U	0.001 U	0.001 U
	06/09/93			0.2 U				
	07/01/93			0.21	0.001 U	0.001 U	0.001 U	0.001 U
	07/29/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	08/30/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	12/03/93		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	03/30/94		0.05	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	06/22/94		0.22	**2**	0.001 U	0.001 U	0.001 U	0.002 U
	09/29/94		1.1	0.9	0.001 U	0.001 U	0.001 U	0.002 U
	07/15/96		0.41	1.0 U				
	10/17/96		0.52	**7.2**				
	01/21/97		0.66	1.0 U				
18 AAC 75 Table C Groundwater Cleanup Levels		1.3	1.5	1.1	0.005	1.0	0.7	10.0

Table 1
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NC Machinery
Fairbanks, Alaska

Sample ID	Sample Date	Total Petroleum Hydrocarbons (mg/L)			Volatile Aromatic Compounds (mg/L) [1]			
		Gasoline-Range [1]	Diesel-Range [2]	Residual Oil-Range [3]	Benzene	Toluene	Ethylbenzene	Total Xylenes
MW-4	03/25/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	05/03/93				0.001 U	0.001 U	0.001 U	0.001 U
	06/09/93			0.2 U				
	07/01/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	07/29/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	12/03/93		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	09/29/94		1.1	0.2	0.001 U	0.001 U	0.001 U	0.002 U
	07/15/96		0.25	1.0 U				
	10/17/96		0.26U	1.0 U				
	01/22/97		0.64	1.0 U				
MW-5	08/30/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	12/06/93		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	03/30/94		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	06/22/94		0.1	0.2 U	0.001 U	0.001 U	0.001 U	0.002
	09/29/94		0.76	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	07/15/96		0.07	1.0 U				
	10/17/96		0.27 U	1.0 U				
	01/21/97		0.27 U	1.0 U				
MW-6	08/30/93			**1.5**	0.004	0.029	0.023	0.179
	12/06/93		**4.3**	**16**	**0.029**	0.15	0.007	0.087
	06/22/94		**3**	**7**	**0.03**	0.13	0.02	0.15
	09/29/94		**24**	**1.9**			0.02	0.25
	07/15/96		**17**	**18**	**0.015**	0.13	0.025	0.29
	10/17/96		**14**	**17**	**0.007**	0.13	0.025	0.28
	01/22/97		**26**	**3**	**0.008**	0.12	0.027	0.3
	04/09/97		0.53	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	01/11/01	0.69	**46.8**	**35.6**	0.0005	0.00631	0.00221	0.0315
MW-7	08/30/93			0.2 U	0.001 U	0.001 U	0.001 U	0.001 U
	12/03/93		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002
	03/30/94		0.05 U	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	06/22/94		0.05 U	0.5	0.001 U	0.001 U	0.001 U	0.002
	09/29/94		0.91	0.2 U	0.001 U	0.001 U	0.001 U	0.002
	07/15/96		0.33	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	10/17/96		0.26 U	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	01/21/97		0.91	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	04/09/97		0.91	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	01/11/01	0.09 U	0.538	0.532 U	0.005 U	0.002 U	0.002 U	0.002 U
18 AAC 75 Table C Groundwater Cleanup Levels		1.3	1.5	1.1	0.005	1.0	0.7	10.0

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Sample ID	**Sample Date**	**Total Petroleum Hydrocarbons (mg/L)**			**Volatile Aromatic Compounds (mg/L)** [1]			
		Gasoline-Range [1]	**Diesel-Range** [2]	**Residual Oil-Range** [3]	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**
MW-8	12/06/93		0.15	0.2 U	0.001 U	0.001 U	0.001 U	0.002 U
	03/30/94		0.05 U	0.2 U				
	09/29/94		**2.7**	**13**	0.001 U	0.001 U	0.001 U	0.001 U
	07/15/96		0.38	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	10/17/96		0.27 U	**2.6**	0.001 U	0.001 U	0.001 U	0.001 U
	01/21/97		0.26	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
	04/09/97		0.65	1.0 U	0.001 U	0.001 U	0.001 U	0.001 U
18 AAC 75 Table C Groundwater Cleanup Levels		1.3	1.5	1.1	0.005	1.0	0.7	10.0

Notes:
AAC = Alaska Administrative Code
U - Parameter was analyzed for, but not detected above the reporting limit shown.
[1] Samples analyzed using methods AK101 (for gasoline-range hydrocarbons) and 8021B (for volatile aromatic hydrocarbons).
[2] Samples analyzed using method AK102-DRO.
[3] Samples analyzed using EPA method 418.1.
[4] Samples analyzed using EPA method 1664.
[5] Samples analyzed using method AK 103-RRO.
Blank Cell - compound was not analyzed for.
Numbers in **bold** font indicate that the results exceed the 18 AAC 75 Table C Groundwater Cleanup Levels

Table 2
Summary of Groundwater Volatile Organic Compound Analytical Results
NC Machinery
Fairbanks, Alaska

Sample ID	Sample Date	Volatile Organic Compounds [1] (mg/L)												
		Benzene	Toluene	Ethylbenzene	Xylenes (Total)	TCA	PCE	DCA	TCE	MEK	Naphthalene	Trichloro-fluoro-methane	1,3,5-Trimethyl-benzene	1,2,4-Trimethyl-benzene
MW-1	01/22/97	0.001U	0.001	0.001U	0.017	0.003	0.001U	0.001U	0.001U	0.001U				
	04/09/97	0.001U	0.001U	0.001U	0.009	0.001U	0.001U	0.001U	0.001U	0.001U				
	01/11/01	0.001 U	0.0012	0.001 U	0.01327	0.00176	0.001 U	0.001 U	0.001 U	0.0229	0.00379	0.00349	0.00597	0.00275
MW-6	01/22/97	**0.008**	0.12	0.027	0.3	0.001U	**0.038**	0.002	**0.009**	0.048				
	04/09/97	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U				
	1/11/01 [2]	0.001 U	0.00614	0.0022	0.0281	0.001 U	**0.0228**	0.001 U	0.00187	0.01	0.012	0.00142	0.0165	0.0185
MW-7	01/21/97	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U				
	04/09/97	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U				
	01/11/01	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U	0.00118	0.001 U	0.001 U
18 AAC 75.375, Table C Groundwater Cleanup Levels		0.005	1.0	0.7	10	0.005	0.005	0.005	0.005	NE	1.46	NE	NE	NE

Notes:
AAC = Alaska Administrative Code
U - Parameter was analyzed for, but not detected above the reporting limit shown.
NE = Not Established
[1] Samples analyzed using EPA method 8260B
[2] 4-isopropyltoluene (0.001 mg/L) and n-propylbenzene (0.00105 mg/L) were also detected in this sample. Neither compound is listed in 18 AAC 75.375, Table C
Blank Cell - compound was not analyzed for.
Numbers in bold font indicate that the results exceed the 18 AAC 75 Table C Groundwater Cleanup Levels

APPENDIX A

TERRA VAC PILOT STUDY
AND
FULL SCALE PROPOSAL

PILOT STUDY AND FULL-SCALE PROPOSAL

NC MACHINERY FACILITY
730 OLD STEESE HIGHWAY
FAIRBANKS, ALASKA

January 30, 2001

PREPARED FOR:

Mr. David Raubvogel
URS Consultants
500 Market Place Tower
2025 1st Avenue
Seattle, Washington 98121

PREPARED BY:

Peter H. Catterall
Project Environmental Scientist

Paul V. Bianco, P.E.
Senior Engineer

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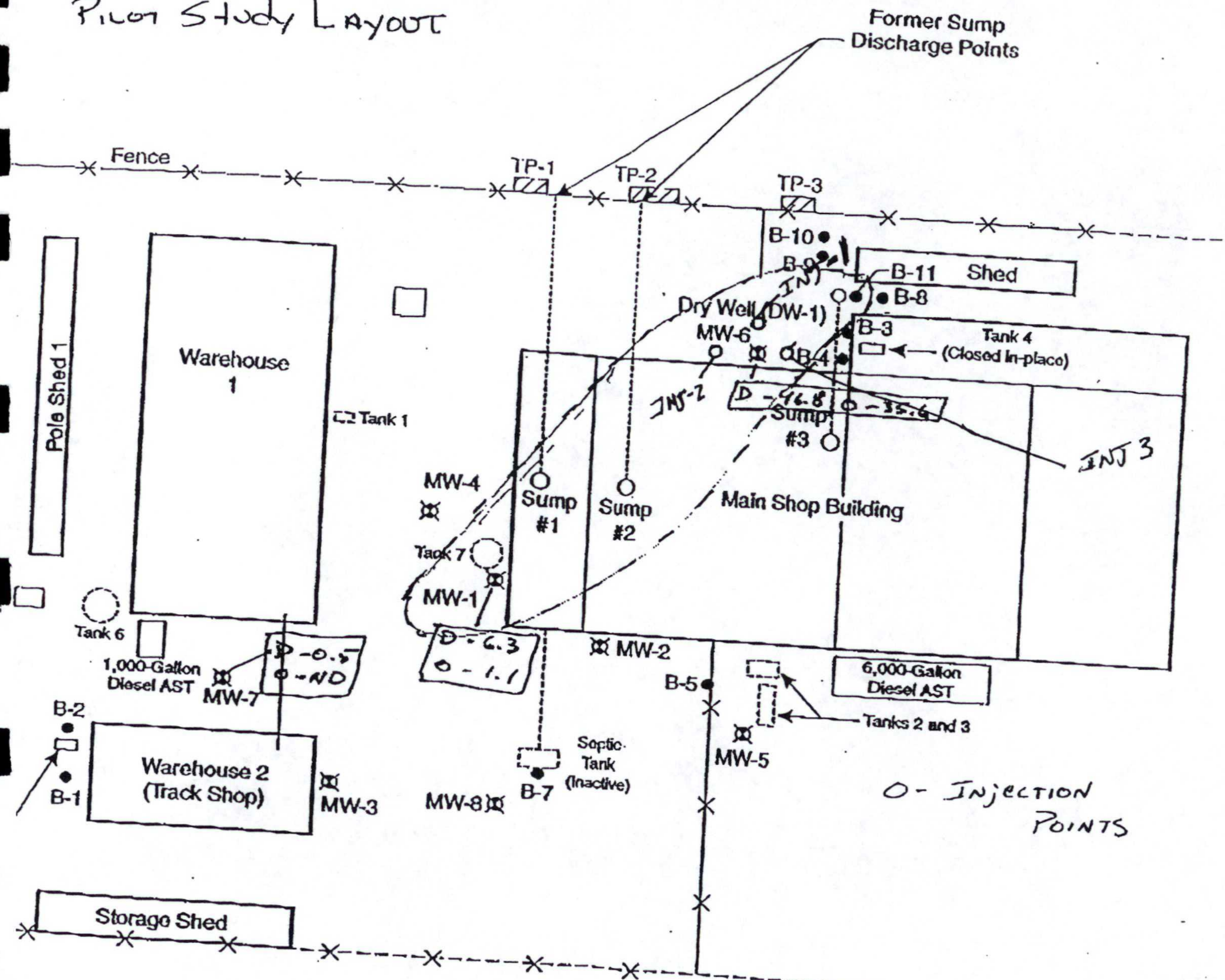
FIGURES

1. Pilot Study Layout
2. Full-scale Layout

FIGURES

Figure 1
Pilot Study Layout



Former/Existing UST Legend	
Tank 1	1,000-gallon heating fuel oil
Tank 2	2,000-gallon heating fuel oil
Tank 3	2,000-gallon heating fuel oil
Tank 4	1,000-gallon heating fuel oil
Tank 5	1,000-gallon heating fuel oil
Tank 6	3,000-gallon unleaded gasoline
Tank 7	1,000-gallon used oil

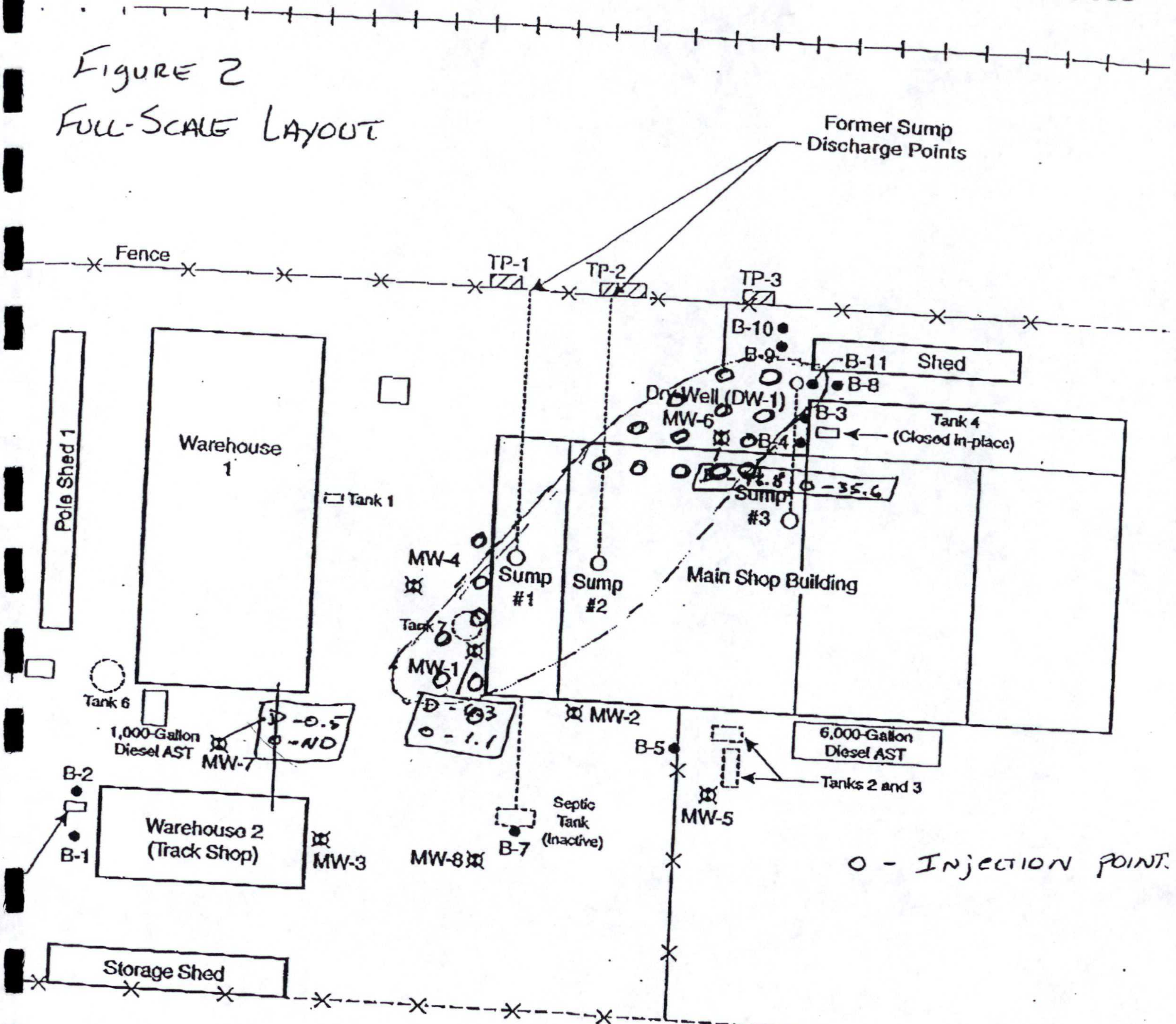
oring

ing Well

D - Diesel-range TPH
O - Oil-range
units mg/L
- Estimated area of TPH-affected Groundwater

SI

FIGURE 2
FULL-SCALE LAYOUT



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Tank 7	1,000-gallon used oil

D - Diesel-range TPH
O - Oil-range
[illegible] mg/L

- Estimated area of TPH-Affected Groundwater

1.0 INTRODUCTION

Terra Vac is pleased to provide the following proposal for the NC Machinery facility, at 730 Old Steese Highway in Fairbanks, Alaska. Our approach to remediation at this site entails injection of a chemical oxidant (Hydrogen Peroxide) to provide in-situ treatment of petroleum and chlorinated solvent impacted groundwater in the vicinity of several previously removed Underground Storage Tanks (UST's) and sump discharge points. This remedial approach will require the following actions:

1. Collect the necessary information regarding the site-specific efficacy of the chemical oxidant with respect to reaction rates and radius of influence. This information will be used to design a full-scale Hydrogen Peroxide injection system. This information will be obtained by performing a one or two day pilot study at the site. Once this pilot study is completed and the results of the post-pilot study groundwater sampling are obtained, a full-scale system can be designed, and an accurate proposal with the time and materials costing for full-scale treatment can be developed.

2. For the purpose of this proposal, an initial time and materials costing based on a preliminary design and available data is included and incorporates the following items:

    - Review of existing site data,
    - Performance of a two day in-situ chemical oxidation pilot study,
      Installation of three one-inch diameter hydrogen peroxide injection wells by direct push for use during the pilot study,
    - Conceptual design of the full-scale injection system,
    - Estimated costing for design, installation, and operation of a full-scale injection system based on the conceptual design.

    For the purposes of proposal review, Terra Vac has provided a costing scenario for site remediation. Further site assessment and completion of the proposed pilot study will allow for a more exact cost for full-scale remediation. Tasks (Tasks 1 through 4) that will be covered under contracting include:

    - Engineering, Permitting, and Reporting
    - System Construction and Installation,
    - System Operations and Maintenance,
    - Closure Activities, Demobilization, and Final Report.

3. Our Remediation System Design will accomplish the following:

1. Directly address dissolved phase petroleum hydrocarbon and chlorinated volatile impacts to groundwater in the vicinity of monitoring wells MW-1, MW-3 and MW-6 through the injection of hydrogen peroxide,
2. Allow current operations by the property owner to proceed while completing all remedial actions required to reach site closure.

2.0 SELECTION OF REMEDIAL TECHNOLOGY

Based on the known site characteristics, Terra Vac has prepared a cost estimate for remediation of groundwater by hydrogen peroxide injection. This cost estimate will be refined based on pilot study testing and further site investigation (e.g., data collected during injection well installation). In-situ chemical oxidation by hydrogen peroxide injection was selected after evaluating several alternatives for site remediation. The technologies evaluated included soil vapor extraction, alone or in combination with groundwater extraction, and air sparging. These technologies were not considered due to low seasonal temperatures, freezing groundwater conditions and costs associated with operations.

Based on site characteristics, Terra Vac believes that remediation of groundwater cleanup can best be achieved using *In-Situ* chemical oxidation with hydrogen peroxide as the preferred chemical oxidant. Hydrogen peroxide decomposes to environmentally inert products, is locally available in the quantities and concentrations necessary for meeting the remedial objectives and can be safely stored and handled on-site by trained personnel.

3.0 PILOT STUDY SCOPE OF WORK

The scope of work for the hydrogen peroxide injection pilot study is as follows:

3.1 Installation of Three One-inch Injection Wells

Terra Vac proposes to install three one-inch injection wells: INJ-1 INJ-2 and INJ-3 (Figure 1) to conduct the pilot study. These wells will be used to gather additional data on subsurface conditions for the full-scale remedial design. These injection wells will be installed using direct push methods to a depth of 20 feet below ground surface (bgs). The screened intervals of these injection wells will extend from 5-20 feet bgs and soil samples will be collected at 5.0 foot intervals during installation. These samples will be screened for total petroleum hydrocarbons and volatile organic compounds (VOCs) using a photoionization detector. Selected soil samples from the drilling will be sent to an Alaska state approved laboratory for analysis of total petroleum hydrocarbons and BTEX by State of Alaska method AK101/EPA 8021B, for diesel range organics by State of Alaska method AK102 and for halogenated volatiles by EPA Method 8260B. After well completion, each of the newly installed wells will be developed and remain in-place for incorporation in the full-scale remedial design.

3.2 Hydrogen Peroxide Injection Pilot Study

Based on site characteristics, Terra Vac believes that remediation for groundwater can best be achieved using *In-Situ* Chemical Oxidation. Chemical oxidation is a remediation technology, which directly treats organic contamination in-situ and can simultaneously clean groundwater, saturated soil, capillary fringe soil, and soil in the "smear" zone located below the static groundwater table. *In-Situ* Chemical Oxidation is most applicable for sites with mixed contaminant types (particularly heavy range petroleum organics and halogenated volatiles) and where impacted groundwater and contaminated soil beneath the groundwater table exist.

In order for *In-Situ* Chemical Oxidation by hydrogen peroxide to be an effective remedial technology for this site, the following parameters must be meet:

- The oxidizing agent (Hydrogen Peroxide) must be introduced in a manner, which allows it to reach the impacted subsurface regions. With the heterogeneous soils present at this site, this introduction can often present a challenge.
- Dissolved iron must be present in the ground water at levels sufficient to generate hydroxyls radical from the injected oxidant. It is the reaction between the petroleum hydrocarbons and/or VOC's and the hydroxyl radicals, which destroys these contaminants.
- The concentration of naturally occurring total organic carbon at the site must be low enough that it does not consume the oxidizing potential of the injected peroxide before the VOC's are oxidized.

To test *In-Situ Chemical Oxidation* at this site, Terra Vac will perform a two-day pilot study to verify that *Chemical Oxidation* is the most appropriate remedial technology for the site and to confirm design assumptions. For this test, the effectiveness of *In-Situ* Chemical Oxidation will be evaluated using three newly installed injection wells, INJ-1 and INJ-2 and INJ-3 (Figure 1). Testing protocol will involve performing chemical oxidant injections in each well individually to determine how many of the parameters described in the objective section can be met. During testing, injection volumes, pressures and radius of influence (ROI) as measured in adjacent monitoring wells will be determined.

In-Situ Chemical Oxidation will be performed at each well followed by a period of approximately four hours to allow the spread of hydrogen peroxide to evolve. During this time, groundwater temperature, dissolved oxygen, and hydrogen peroxide concentration will be monitored at in existing monitoring wells adjacent to the injection locations.

At the conclusion of the pilot test, groundwater samples will be collected at from the existing monitoring wells and analyzed for the following constituents: total petroleum hydrocarbons and BTEX by State of Alaska method AK101/EPA 8021, total diesel range organics by AK method 102 and halogenated volatiles by EPA method 8260B.

With the results of the Pilot Study, Terra Vac will be able to refine our initial system design and offer a more accurate bid costing.

4.0 REMEDIATION GOALS

Terra Vac will achieve the following remediation goals at this site:

- Remediate subsurface saturated soil in the vicinity of monitoring wells MW-1, MW-3 and MW-6 to meet the proposed clean-up standards set by the Alaska Department of Environmental Conservation (ADEC).

- Remediate groundwater in the vicinity of monitoring wells MW-1, MW-3 and MW-6 to meet the proposed clean-up standards set by the Alaska Department of Environmental Conservation (ADEC).

- Allow current operations by the property owner to proceed while completing all remedial actions required to meet site closure levels for groundwater.

5.0 REMEDIAL APPROACH

To reach our stated remediation goals dissolved phase petroleum hydrocarbons and chlorinated VOC concentrations must be reduced. Given existing site conditions, this can best be accomplished through injections of hydrogen peroxide to the saturated soil and groundwater across the impacted portions of the site.

Terra Vac intends to treat impacted saturated soil and groundwater using *In-Situ* Chemical Oxidation. As part of the *In-Situ* Chemical Oxidation operations, a hydrogen peroxide mixing and holding tank will be temporarily installed at the site. Concentrated hydrogen peroxide will be delivered by a local supplier and transferred to the holding tank where it will be diluted with water to produce the injection solution. This hydrogen peroxide injection solution will then be transferred by pump to each well head and injected at low pressure into the surrounding subsurface.

A preliminary *In-Situ* Chemical Oxidation system configuration is presented as Figure 2. The system consists of seventeen newly constructed injection wells (in addition to the three installed for the pilot study). System design allows for source coverage and simultaneous saturated soil and groundwater treatment. A conservative radius of influence (ROI) of 10 feet at each well was used in system design.

During the pilot study, a chemically resistant high-pressure hose will be used to transfer the injection solution to each well head. Once a full-scale injection system has been designed, sub-surface transfer piping will be installed to add a greater degree of system automation. Typically when a sub-surface injection system is installed, the injection wells will be connected with 1-inch pressure-rated branch piping to a common 1.5-inch header pipe. All system piping will be placed subsurface and well heads will be accessed through flush-mounted well boxes. Each well box is equipped with an injection solenoid valve operated by a centralized control panel. A moderate pressure chemical transfer pump connected to the holding tank provides injection pressure. The system operator the uses the central control panel to control the dispensing of various volumes of hydrogen peroxide, and is often the most cost effective method of managing this type of remedial action at remote or distant locations. Terra Vac personnel to ensure safe and controlled handling and dispensing of the hydrogen peroxide injection solution will perform monthly hydrogen peroxide injections.

Due to the low season all temperatures and freezing groundwater conditions present at this site, Terra Vac expects that six-months of system operation per year will be the most cost effective approach and all that can reasonably be expected at this site.

Terra Vac has designed, installed, and performed hydrogen peroxide injections at several active sites. System installation is coordinated with the site managers and all piping and wells are completed below grade.

Equipment is housed in a 15-foot x 15-foot compound, tentatively located near monitoring well MW-6 northeast of the main shop building. This location places the equipment away from the front of the building and storage yard. For costing purposes, Terra Vac has considered a heated enclosure constructed on a gravel pad (with a lined berm and sump) for support of the remediation equipment. A 6-foot high temporary security fence with privacy slats will surround the secured compound.

System equipment will include a 250-gallon mixing and holding tank, and an electric transfer pump and control station. System electrical requirements are single phase, 120/240 Volt, 100 Amp service. Power can either be dropped to the enclosure or connected to the existing power distribution panel in the shop building. In addition to electrical power, a source of potable water will be required for mixing and dilution of the hydrogen peroxide injection solution and for purging the transfer piping.

6.0 FULL-SCALE SCOPE OF WORK

Terra Vac routinely breaks down remediation projects into the following tasks to establish project deliverables and schedule.

Task 1: Engineering, Permitting, and Reporting

After system design, preparation of a site specific Health and Safety Plan, and application for permits can proceed. Permits include well construction, hydrogen peroxide injection, building, fire, and electrical permits, or other applicable permits.

Task 2: System Construction and Installation

This task includes probing and well construction, placement of all subsurface piping and well boxes, restoration of site surface, completion of the well heads, mobilization and installation of the remediation equipment, and remediation system startup.

Terra Vac, if possible, will use excavated native soil for trench backfill. Disposal of soil generated during well installation and trenching (if required), decontamination water and water generated during groundwater sampling will be the responsibility of URS or their client.

During construction of the new wells, Terra Vac will perform soil sampling at 5 foot intervals for logging and on-site screening with a photo ionization detector. To help establish existing subsurface conditions, and to complete site characterization for the final report, at least one soil sample, typically from the soil/groundwater interface, will be submitted to an independent laboratory for analyses. Laboratory analyses will include total petroleum hydrocarbon and BTEX by Alaska method AK101/EPA 8021B, total diesel range organics by Alaska method AK102 and, halogenated volatiles by EPA Method 8260B.

Costing includes our estimate for a State of Alaska licensed electrical subcontractor to construct equipment disconnects and install sub-surface electrical connections.

Upon startup, Terra Vac will collect data to document initial site conditions, to determine injection volumes and pressures, overall system effectiveness, and compliance with health and safety regulations. Start-up pricing includes collection of groundwater samples from adjacent monitoring wells for analysis of both dissolved oxygen and hydrogen peroxide concentration.

Task 3: System Operations and Maintenance

Terra Vac provides all system operations, equipment maintenance, and equipment repairs.

During operations, monthly monitoring of both dissolved oxygen and hydrogen peroxide concentrations in groundwater will be performed. In addition, quarterly groundwater sampling will be conducted by Terra Vac for total petroleum hydrocarbons and BTEX and for halogenated volatile organics. Groundwater samples will be collected from 5 of the existing monitoring wells adjacent to the injection points. This data is used to optimize system performance, determine if design changes are warranted, and to estimate the remediation schedule. Our proposal includes complete monthly injections, monitoring and sampling visits.

Monthly injections and sampling ensure safe operation of the injection equipment while allowing for the calculation of petroleum hydrocarbon oxidation rates and the flexibility to make changes to the remedial approach.

Task 4: Closure Activities, Demobilization, and Final Report

Once the groundwater data indicates site cleanup is complete, Terra Vac and Dames & Moore will perform a system "rebound test". Rebound testing involves discontinuing hydrogen peroxide injections and allowing 2-4 weeks to allow the subsurface to reach equilibrium. Groundwater from adjacent monitoring wells is sampled. If the data from rebound testing and additional conformational groundwater monitoring indicates that site remediation is complete, a final report will be prepared for Dames & Moore.

Once site cleanup has been confirmed, all aboveground equipment can be removed from the site and equipment utilities are disconnected. Costs for well removal/abandonment are included in our proposal.

TERRA VAC

Terra Vac
Northwest Division
23106 100th Avenue West
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May 21, 2001

Mr. David Raubvogel
URS Corporation
1400 Century Square
1501 4th Avenue
Seattle, Washington 98101-1662

Re: OxyVac™ Bench Scale Proposal
NC Machinery Facility, Fairbanks, Alaska

Dear Mr. Raubvogel:

Terra Vac is pleased to present to you this addendum to the proposal dated January 30, 2001 for OxyVac™ remediation at your site located in Fairbanks, Alaska. This addendum addresses the option to perform an OxyVac™ bench scale study to test the efficacy of the technology prior to the full-scale system implementation. The workplan for the performance of the OxyVac™ pilot study are presented in the following sections.

1.0 INTRODUCTION

In 1994, Dames & Moore conducted the Underground Storage Tank (UST) Site Assessment/Release Investigation to document the removal of three USTs: one 1,000-gallon heating fuel UST (Tank 1) and two 2,000-gallon heating fuel USTs (Tanks 2 and 3). A 3,000-gallon unleaded gasoline UST (Tank 6) and 1,000-gallon used oil UST (Tank 7) were previously removed by NC Machinery and the closure activities were documented in a report prepared by NC Machinery entitled "Site Assessment Report for Gasoline Underground Storage Tank Removal," dated November 11, 1994.

A Release Investigation was also conducted to evaluate the potential presence of petroleum hydrocarbons and other potential chemical constituents of concern related to: an inactive septic tank, a former dry well, and former sump discharge lines associated with the main shop building. A Corrective Action was implemented which included the removal of petroleum-affected soils from the excavations of former Tanks 1, 2, and 3 as well as from the vicinity of an inactive dry well (DW-1) and two former surface sump discharge areas located in the northern portion of the subject property.

The shallow groundwater quality beneath the property has been monitored since 1993. Based on the early groundwater monitoring data, it was apparent that the shallow groundwater at the site had been affected by petroleum hydrocarbons in the diesel-range (TPH-d) in the immediate vicinity of former Tanks 2 and 3 and Tank 7. Shallow groundwater in the vicinity of the former dry well detected total petroleum hydrocarbons (TPH), TPH-d, benzene, toluene, ethylbenzene, and total xylenes (BTEX), and chlorinated volatile organic compounds (VOCs) above available Alaska Department of Environmental Conservation (ADEC) groundwater maximum contaminant levels (MCLs). Shallow groundwater in the vicinity of the inactive septic tank detected elevated levels of TPH and TPH-d.

2.0 TECHNICAL APPROACH

The OxyVac™ process involves the injection of hydrogen peroxide into the subsurface. In addition, Soil Vapor Extraction (SVE) is used when necessary, to remove the oxidized by-products.

The OxyVac™ process has gained wide acceptance as a proven in-situ remedial technology to address a variety of subsurface contamination problems. Because of its oxidation potential, hydrogen peroxide (H_2O_2), and more specifically, the hydroxyl radical, is known to be an effective treatment method for removal of contaminants from soils and waste streams. The oxidation potential of H_2O_2 is a well-known phenomenon, which has been studied since the turn of the century. The fundamental reaction is the oxidation of an organic molecule, such as hydrocarbon, phenol or chlorinated compound to form a variety of oxidized products. In a complete oxidation reaction, one by-product might include CO_2, or if the oxidation is incomplete, then by-products might include alcohols, aldehydes or carboxylic acids, all of which are very biodegradable. Fundamentally, the oxidation by H_2O_2 generates no toxic by-products, is environmentally benign, and the H_2O_2 itself may be degraded by subsurface microbial enzymes.

The catalyst of the oxidation is ferrous iron (Fe^{2+}) which when combined with H_2O_2 produces the hydroxyl radical (OH•) in a reaction commonly referred to as Fenton's Reaction, named after the individual who first discovered the reaction in 1876. This reaction is written as:

$$H_2O_2 + Fe^{2+} \quad OH\bullet + OH^- + Fe^{3+}$$

This type of reaction is catalyzed when hydrogen peroxide contacts naturally occurring iron contained in soil and rock. In cases of low or insufficient ferrous iron content, the reaction may be catalyzed by ferrous sulfate ($FeSO_4$). The heat produced by the reaction causes volatilization and chemical oxidation of the contaminants.

The introduction of hydrogen peroxide to the subsurface may be accomplished by a variety of methods, including direct injection to wells, surface injection, or by high pressure subsurface injection to open boreholes by methods similar to pneumatic fracturing or jet-grouting.

3.0 SCOPE OF WORK

In order to assess the accurate concentrations and number of applications necessary to achieve the clean-up goals at this site, Terra Vac recommends a bench-scale study before starting field-work.

3.1 Bench-Scale Study

Prior to the bench-scale study, soil samples will be collected in impacted areas of the site, at the areas that contained the highest historical soil and groundwater concentrations. It is expected that the soil will be saturated or have a high moisture content, therefore groundwater samples will be unnecessary.

The soil will be shipped to Terra Vac's in-house laboratory in Windsor, New Jersey. The samples will be combined into one sample and testing performed on the composite sample. All analysis will be performed in-house, with the exception of the baseline and final iron and organic analysis.

A series of tests will be performed on the soil using varying concentrations of hydrogen peroxide and iron additives. An aliquot of saturated soil will be placed into a sample jar; and a series of hydrogen peroxide additions will follow. After each addition, the soil and hydrogen peroxide will be mixed and allowed to react. After an allotted amount of time, an aliquot will be taken from each jar and analyzed for total VOCs and TPH-d. During the test the soils and groundwater will be monitored for pH and temperature as well as VOCs and TPH-d. All of the samples will be baseline tested for VOCs, TPH-d, pH, and temperature. The composite sample will also be sent for baseline iron analysis. A series of controls will also be set-up in order to validate the study.

The results from this bench-scale study will allow Terra Vac to determine the most effective concentration of hydrogen peroxide as well as the number of additions necessary to achieve the clean-up goals.

4.0 COST

The cost for work outlined above is estimated below. The bench-scale test cost is based on obtaining a soil sample provided by NC Machinery. If Terra Vac personnel have to mobilize to the site, it may result in an increased cost adjustment.

The estimated fees for the bench-scale study are estimated at $ 9,700.

Terra Vac appreciates this opportunity to be of service to you and we look forward to working with you on this project.

Sincerely,

Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

cc: 32.0037.01

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